



OLLSCOIL NA GAILLIMHE
UNIVERSITY OF GALWAY

Semester 1 Examinations 2023/2024

Course Instance 4BCT1, 4BP1, 4BP4
Code(s)
Exam(s) B. Sc. Degree (Computer Science & Information Technology)
B. Eng. (Electronic & Computer Engineering)
Module Code(s) CT417
Module(s) Software Engineering III

Paper No. 1

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Instructions: Answer ALL questions.

Duration 2 hours
No. of Pages 5
Discipline(s) Computer Science
Course Co-ordinator(s) Dr. Colm O’Riordan

Requirements:

Release in Exam Venue	Yes
MCQ Answersheet	No
Handout	None
Statistical/ Log Tables	None
Cambridge Tables	None
Graph Paper	None
Log Graph Paper	None
Other Materials	None
Graphic material in colour	No

PTO

CT417 Software Engineering III

Exam Duration: 2 Hours

Answer ALL questions

Question 1: 15 Marks

You are the project manager for the "Soccermatic" web application project, which aims to develop a predictive model to forecast the outcomes of weekly Premier League football matches. This project has been underway for several months and is currently in the modelling phase. The project team includes data scientists, machine learning engineers, web developers, and user interface designers.

The Agile approach, specifically Scrum, has been chosen to manage the project's dynamic nature and evolving requirements.

a) Describe the Agile Manifesto and list TWO of its core principles.

[4 marks]

In the project, the team has encountered challenges in terms of rapidly changing requirements and evolving data sources. These challenges have led to delays and disruptions in the development process.

b) As a project manager, propose a strategy to address these issue following one of the Agile 12 principles that you think relevant. You need to:

- Identify the relevant principle to resolve this issue.
- Propose TWO solutions to resolve this issue following the chosen principle.

[6 marks]

The development team has encountered challenges related to the accuracy and reliability of the predictive model. Predictions are not consistently meeting the desired standards, and users are expressing concerns. You have identified that "Collaboration between the business stakeholders and developers throughout the project" will be the principle that can be taken to address this issue.

c) Suggest FIVE specific steps the team should take to resolve this issue using the key principle identified above.

[5 Marks]

PTO

Question 2: 15 Marks

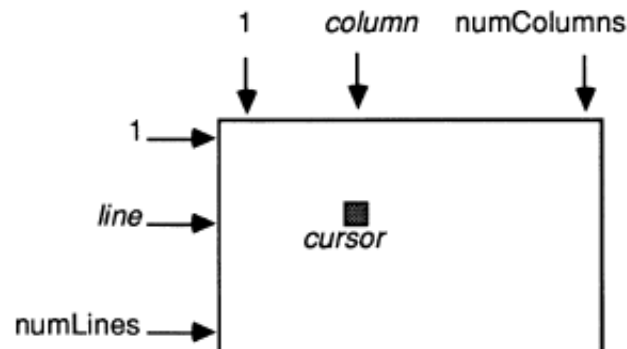
Formal specification in software engineering is a method to precisely and mathematically describe system requirements and behaviour.

a) List THREE advantages of using Formal Specifications.

[3 Marks]

Consider the following description:

The display of a computer terminal shows lines of characters with each line consisting of a fixed number of columns containing a character in a fixed-width typeface. A cursor marks a current position of interest on the display. We can assume that the lines are numbered from 1 to numLines down the display and the columns are numbered 1 to numColumns across the display as shown in the figure below.



b) Describe the initial state schema for Cursor.

[2 marks]

c) Define a schema DownKeyNormal to define the operation of pressing the down key. Write a schema which deals with what happens when the cursor is not on the bottom line of the display.

[4 Marks]

d) Define a schema DownKeyAtBottom to define the operation of pressing the bottom key. Write a schema which deals with what happens when the cursor is on the bottom line of the display.

[4 Marks]

e) Define the full behaviour.

[2 Mark]

PTO

Question 3: 15 Marks

RFC 2828, titled "Internet Security Glossary," is a document published by the Internet Engineering Task Force (IETF). It serves as a comprehensive glossary of terms and definitions related to various aspects of computer and internet security. Based on the documentation,

a) Define the meaning of “vulnerability”

[2 marks]

b) Define the meaning of “countermeasures”.

[2 marks]

Stuxnet worm, which targeted industrial control systems, and the 2017 WannaCry ransomware attack are examples of zero day vulnerabilities, which leveraged a zero-day exploit in Microsoft Windows. These incidents had far-reaching consequences, underscoring the risks posed by zero-day vulnerabilities.

c) What is zero-day vulnerability?

[2 marks]

d) Describe a typical life cycle of a zero-day vulnerability.

[5 marks]

e) Some library function in C are vulnerable to buffer overflow attack. Define and explain the concept of a “buffer overflow” and how this vulnerability can be exploited by attackers.

[4 marks]

PTO

Question 4: 15 Marks

Continuous Integration (CI) is a fundamental practice in the Continuous Integration/Continuous Delivery (CI/CD) pipeline and plays a crucial role in modern software development.

a) List THREE advantages of a typical CI process.

[3 marks]

b) Discuss THREE potential pitfalls that organisations may encounter when adopting CI/CD practices.

[6 marks]

JUnit simplifies the testing process by providing a framework for organizing and executing tests. It allows for automated testing, enabling rapid feedback on code changes and facilitating test-driven development.

You are given an example Java class, "Calculator", which contains various mathematical methods. Your task is to design and write JUnit test cases to thoroughly test these methods.

```
public class Calculator {  
    // Method to add two integers and return the result  
    public int add(int a, int b) {  
        return a + b;  
    }  
}
```

The "add" method takes two integers, a and b, as parameters and returns their sum. This method is quite straightforward and is commonly used for addition operations in calculator or arithmetic applications.

c) Discuss THREE test cases that will allow for a complete and thorough test for the add method (consider the various operands that can be used with this operator – whenever necessary, provide the sample codes).

[6 marks]

END